UNITED NATIONS

ST

Secretariat

GENERAL

ST/SG/AC.10/C.2/25/Add.1
26 August 1986

Original: ENGLISH

COMMITTEE OF EXPERTS ON THE TRANSPORT OF DANGEROUS GOODS

GROUP OF RAPPORTEURS

REPORT OF THE GROUP OF RAPPORTEURS ON ITS THIRTY-FIFTH SESSION (5-8 August 1986)

Addendum 1

Annexes to the Report

Annex 1 - CLASSES 4.2 AND 5.1

Annex 2 - INTERMEDIATE BULK CONTAINERS (IBCs)

Annex 3 - MISCELLANEOUS AMENDMENTS

Annex 4 - REPORT OF THE WORKING GROUP ON LISTING AND CLASSIFICATION

Annex 5 - REPORT OF THE WORKING GROUP ON ORGANIC PEROXIDE TEST METHODS

GE.86-23071/4334E

Annex 1

CLASSES 4.2 AND 5.1

Class 4.2 substances liable to spontaneous combustion

1.1 (For self-heating substances)

1.2 General Description of the Test Method

Samples 2.5 cm, [5 cm] or 10 cm cube are kept at a constant temperature in a vessel for twelve hours [48 hours] and observation is made whether the temperature of a sample exceeds 200°C [400°C] within the 12 hours [48 hours]. This test method is a modified version of the Bowes-Cameron cage test which is a self-heating test method for carbon.

1.3 Test Equipment

1.3.1 Vessel

This is a hot air circulating type of vessel with an inner volume of over 9 l and capable of controlling the internal temperature at 140 ± 2°C.

1.3.2 Sample container

A cubic sample container of 2.5 cm, 5 cm or 10 cm length, made of stainless steel net of 300 mesh/inch, whose top surface is open is used. This is housed in a cubic container cover made of 28 mesh stainless steel net and slightly larger than the sample container, so that it fits in this cover. In order to avoid the effect of circulating air, another stainless steel cage, made of 28 mesh net and 15 x 15 x 25 cm in size, is further installed to house the cover.

1.3.3 Temperature Measurement

Chromel-Alumel thermocouples of 0.3 mm diameter are placed at the centre of the sample container. The temperatures are measured continuously. The equipment is illustrated in Fig. 1.

1.4 Test Methods

Powder or granular samples are used as for transport and lumpy samples are broken to pass through a 10 mesh sieve, then the container is filled to the brim and tapped several times, if the sample settles, more is added. On the other hand, if the sample is heaped, it is levelled to the brim. The container is housed in the cover and hung at the centre of the vessel. The temperature is raised to 140°C and kept

there for 12 hours [48 hours]. The temperature of the sample is recorded. The first test is conducted with a 10 cm cube sample and if spontaneous ignition occurs, a similar test will be repeated using a 2.5 cm cube sample, [and a 5 cm cube respectively].

1.5 Criterion for Classification and Assignment for Packing Group

When the temperature of a sample exceeds 200°C [400°C] within 12 hours [48 hours], the sample is recognized as being liable to spontaneous combustion. If this result is obtained only with a 10 cm cube, the substance is classified as Packing Group III. If the result can be obtained also with a 2.5 cm cube, the substance is classified as Packing Group II.

For CLASS 4.2 PYROPHORIC SUBSTANCES, see text in document ST/SG/AC.10/C.2/R.518.

Division 5.1 (solids)

In document ST/SG/AC.10/C.2/23, annex 1, make the following changes:

1. Delete square brackets from paragraphs 1.1, 1.2.1, 1.2.3 and 1.3. "[sodium peroxide] [potassium bromate]."

2. At the end of paragraph 1.4.2, insert:

   "[sodium peroxide] [potassium bromate]."

3. At the end of paragraph 1.4.2, insert:

   "[sodium peroxide] [potassium bromate] and that of [sodium nitrite] [potassium perchlorate]."

4. At the end of paragraph 1.4.3, amend to read:

   "... between that of ammonium persulphate and [sodium nitrite] [potassium perchlorate]."

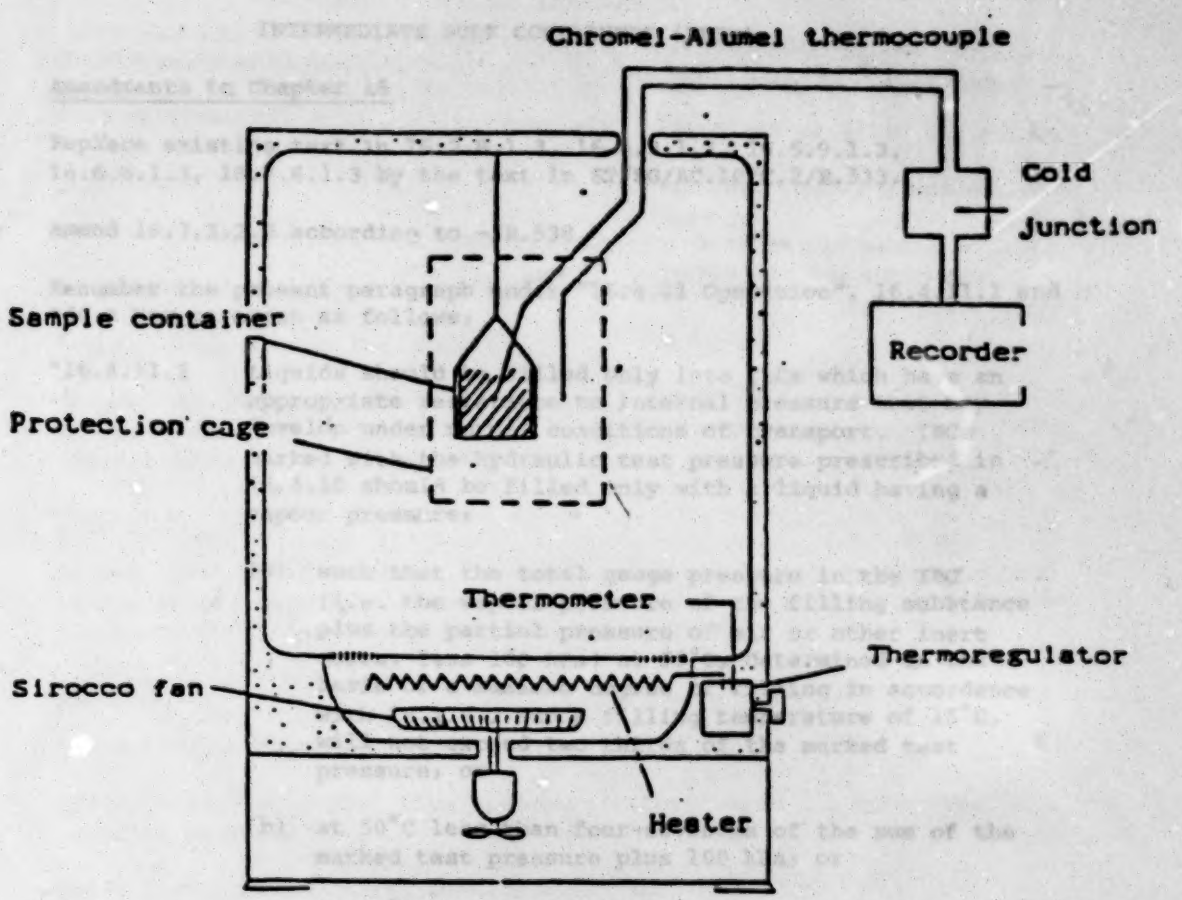

Fig. 1 Test equipment for substances liable to spontaneous combustion

Annex 2

INTERMEDIATE BULK CONTAINERS (IBCs)

Amendments to Chapter 16

Replace existing text in 16.2.8.1.3, 16.4.9.1.3, 16.5.9.1.3, 16.6.6.1.3, 16.7.6.1.3 by the text in ST/SG/AC.10/C.2/R.533.

Amend 16.7.3.2.2 according to -/R.539.

Renumber the present paragraph under "16.4.11 Operation", 16.4.11.1 and add a new paragrah as follows:

"16.4.11.2 Liquids should be filled only into IBCs which have an appropriate resistance to internal pressure that may develop under normal conditions of transport. IBCs marked with the hydraulic test pressure prescribed in 16.4.10 should be filled only with a liquid having a vapour pressure:

(a) such that the total gauge pressure in the IBC (i.e. the vapour pressure of the filling substance plus the partial pressure of air or other inert gases, less 100 kPa) at 55°C, determined on the basis of a maximum degree of filling in accordance with 16.1.6.2 and a filling temperature of 15°C, will not exceed two thirds of the marked test pressure; or

(b) at 50°C less than four-sevenths of the sum of the marked test pressure plus 100 kPa; or

(c) at 55°C less than two-thirds of the sum of the marked test pressure plus 100 kPa."

A new subsection should be introduced into 16.5 namely "16.5.11 Operation" followed by the same text as above with "16.5.10" instead of "16.4.10".

16.3.6.4.5 complete the last sentence by adding "... after the IBC has been raised clear of the ground."

16.3.6.5.3 Method of testing

Replace existing text by the following:

"The IBC should be caused to topple onto any part of its top onto a rigid, non-resilient, smooth, flat and horizontal surface."

16.5.9.5.5 Criteria for passing the test

Replace the existing text by

"No permanent deformation which renders the IBC unsafe for transport and no leakage."

Annex 3

MISCELLANEOUS AMENDMENTS

Amend new Special Provision 1XY (ST/SG/AC.10/C.2/23, annex 3) to read: "... is to be decided by the regulatory authority for the individual mode of transport".

Chapter 9

9.5.1, amend as follows:

"... durable, legible and readily visible markings ...."

After 9.5.7, add the following:

"Note: The markings, for which examples are given in 9.5.6 and 9.5.7, may be applied in a single line or in multiple lines provided the correct sequence is respected."

Chapter 2

UN Nos. 2791 and 2792 should be deleted as well as the related entries in the index: Aircraft thrust device for assisted take-off and Igniter for aircraft thrust device for assisted take-off.

Table 6.1:

Add below "aldrin":

"2588, 2902, 2903, 3021 alkaloids or alkaloid salts ... according to toxicity criteria"

Amend first column of allidochlor entry to read:

"2761, 2762, 2995, 2996"

Amend first column of butocarboxim entry to read:

"2757, 2758, 2991, 2992"

Delete entry for fenchloralin.

Add below "omethoate":

"2786, 2787, 3019, 3020 organotin pesticides ... according to toxicity criteria"

Amend paraoxon entry to read:

"2783, 2784, 3017, 3018 *paraoxon ..... 100->35, 35->3.5, 3.5-0.9, 3.5-0.35"

Amend first column of terbumeton entry to read:

"2764, 2997, 2998"

Amend first column of DNOC entry to read:

"2779, 2780, 3013, 3014"

Amend first column of nicotine compounds and preparations entry to read:

"2588, 2902, 2903, 3021"

Amend first column of pindone (and salts of) entry to read:

"2902, 2903, 3021"

Amend first column of strychnine entry to read:

"2588, 2902, 2903, 3021"

Amend first column of the entries for thallium compounds and thallium sulphate to read:

"2588, 2902, 2903, 3021"

Chapter 2 and Index:

Delete UN No. 2472 Pindone entry

Chapter 2 and paragraph 13.8.4 and Index:

Delete UN No. 1681 Rodenticides, N.O.S. entry

Chapter 3:

Amend Special Provision 43 to read:

"For a pesticide, see 6.6 and Table 6.1"

Chapter 2:

Add Special Provision 43 to the following entries:

1544, 1556, 1557, 1570, 1598, 1621, 1651, 1655, 1674, 1686, 1707, 2024, 2025, 2026, 2027, 2788.

Delete Special Provision 43 from the entry UN No. 1611.

Annex 4

REPORT OF THE WORKING GROUP ON LISTING AND CLASSIFICATION

1. An informal group met to give preliminary consideration to the proposals in documents listed under item 9 of the agenda, Listing and Classification. Those concerning organic peroxides were left to the appropriate experts.

2. No additional data was available for ST/SG/AC.10/C.2/R.492 so it was left.

3. The proposal for differentiating between "solid" and "liquid" substances in paragraph 4 of -/R.496 from ICAO was not carried, even in the modified form of adding "liquid or solid" to each of the proper shipping names listed. Some experts felt that there was not a very real problem and answers already existed or the modes could cope with their own particular difficulties. Of the proposals in paragraph 5, some were withdrawn by ICAO; UN No. 1333 was left until document -/R.528 should be discussed; those for UN Nos. 1578, 1851, 1790, 1791, 1796, 1826 and 2031 were not accepted. The new entry for isocyanates, in addition to UN No. 2206 was adopted; the logic of the argument concerning UN No. 2480 was accepted but the solution proposed was to delete "or METHYL ISOCYANATE SOLUTIONS".

4. In -/R.502 from ICAO, other than the proposals that concerned organic peroxides, the first in paragraph 1 was adopted; the second (for UN No. 2344) was agreed, though some delegates felt the existing text (no actual change in classification was being introduced) covered the actual situation better since in practice the flash point was not consistently determined as 19°C. The proposal in paragraph 3 was not adopted, some experts asking for more information, others pointing out that this was a recording of detail which if accepted could be applied to many other examples.

5. There were some outstanding points in -/R.512 and Add.1 from IMO. Aerosols in paragraph 4 were not pursued on the grounds that the classification was different in the Recommendations and the IMDG Code (Class 2 and 9 respectively).

6. There was considerable reluctance on the part of some experts to accept the additions to 13.8.4 listed in paragraph 7 for fear of defeating the original purpose of 13.8.4. Finally the UN Nos. for explosives were sent to the Group of Experts on Explosives. The rest, except for 2756, were adopted. For decisions concerning the deletions proposed in paragraph 8 see below.

7. Note was taken of the differences between the IMDG Code, section 18 and chapter 15 of the Recommendations (see /R.512/Add.1, paragraph 9 and annex 1) in particular the signicantly lower figures for class 4.3 but no changes were recommended.

8. The addition of "physical state" to 1.40 and 1.41 of the Recommendations in accordance with paragraph 12 received qualified approval but on reflection some experts pointed out that this would give rise to major inconsistencies, the texts were not identical in several respects and the obligation to reclassify according to 5.3.3 of the IMDG Code would conflict with the possibility to reclassify under 1.41 of the Recommendations.

9. The proposals in paragraphs 14 and 15 were adopted and note taken of paragraph 17.

10. The question of methyl isocyanate was considered on the basis of documents -/R.497 and -/R.517 (USA and Canada respectively) and a detailed data sheet from the USA, reclassification to 6.1 was accepted. Both the USA and Canada agreed that the remaining substances in their respective proposals should be considered individually on the basis of data sheets to be presented in the future.

11. The proposals concerning Formetanate in -/R.524 (FRG) were examined, note being taken that the same proposals appear in -/R.530 (Switzerland).

12. The arguments in -/R.528 (FRG) for UN Nos. 1323 and 1333 and a new entry were accepted but not in the form proposed. The proposal concerning UN No. 1383 was considered premature.

13. Canada had received information about butyraldoxime, UN No. 2840, from their industry. Their paper -/R.551 asked for further information with a view to possible reclassification but although representatives from the FRG, the United Kingdom, the United States, the Netherlands and HMAC had investigated this substance, no delegation had any evidence to support reclassification. The proposal was not therefore adopted.

14. No delegation had information on the entry UN No. 1867 "CIGARETTES SELF-LIGHTING", which Canada proposed to delete in -/R.552. The representative of ICAO noted that this entry was forbidden in air transport. The representative of the Netherlands saw some psychological valve in retaining the entry but it was, nevertheless, agreed to delete it in chapter 2 and in the Index.

15. Canada suggested, in -/R.553, that the present entry for UN No. 1385 should be modified by deleting the classification and the packing group and adding Special Provisions 26 and 76. However, it was pointed out that Special Provision 26 related specifically to UN No. 1261 and that Canada's suggestion would effectively create a water-wetted explosive for which there was no corresponding Class 1 entry. It was also noted that RID/ADR now listed the substance in Class 4.2, 6(c). It was therefore agreed to make no change.

16. In a late paper, Japan asked for methacrylonitrile to be listed in Chapter 2 as Class 3, Subsidiary Risk 6.1 and Packing Group I. The representative of the USA had tested the vapour of this substance and presented some up-to-date LC_{50} data which would confirm the current RID/ADR listing in Class 3, 11(b). However, it was noted that Japan's figure for dermal toxicity would justify PG I. The representative of the FRG suggested that "INHIBITED" should be added to the chemical name but it was felt that this needed more consideration. It was generally agreed that the substance should be listed in chapter 2 and Japan's proposal was accepted.

17. In a late paper, CEFIC proposed to amend UN No. 2755 but agreed to obtain certain additional data for inclusion in an official paper to the Committee.

18. The representative of ICAO was invited to present a formal proposal to the Committee of Experts to amend the name and description of UN No. 3028.

19. An informal group also met to give preliminary consideration to the proposals in those documents listed under item 9 of the agenda, Listing and Classification, which related specifically to organic peroxides.

20. Document -/R.465/Add.1/Corr.1. Although some representatives considered ICAO's proposal to be unnecessary, it was agreed to add S.P. 175 to all the liquid organic peroxides listed in paragraph 4 of the document. The representative of the FRG suggested that this Special Provision should also refer to 11.3.8, but he was invited to pursue the idea on another occasion.

21. Document -/R.502. It was generally agreed that ICAO's proposal to amend 25 UN entries listed in paragraph 4 to provide for all concentrations of particular organic peroxides was desirable in principle but as no texts were available, specific new proposals should be made on a future occasion.

22. Document -/R.512/Add.1, paragraph 7. It was agreed to add UN No. 2756 "ORGANIC PEROXIDES, MIXTURES" to the list of N.O.S./generic entries in 13.8.4, as proposed by IMO. It was also agreed to delete the words "and additionally with the name of the main constituent of the mixture" from the first sentence and the second sentence, both from S.P. 104.

23. Document -/R.536. The representative of the Federal Republic of Germany had proposed to list the peroxide MMPPH 85% in chapter 2 with a new Special Provision exempting it from the provisions of Division 5.2 if transported in packagings up to 400 kg. The representative of the United Kingdom said that the product was only produced in the United Kingdom and had been assessed as non-dangerous in any quantity, after tests, by the United Kingdom competent authority. The representative of the United Kingdom agreed to compare data with the representative of the Federal Republic of Germany.

AMENDMENTS PROPOSED BY THE WORKING GROUP

1. Add new entry in chapter 2

"UN 30XX ISOCYANATES N.O.S. or
ISOCYANATE SOLUTIONS, N.O.S.
flash point not less than 23°C and
not more than 60.5°C and boiling
point less than 300°C
Division 6.1, SR 3
S.P. 109, PG II, M"

2. In chapter 2, UN No. 2206, delete S.P. 75, amend Name and Description to:

"ISOCYANATES N.O.S. or ISOCYANATE
SOLUTIONS, N.O.S., flash point more
than 60.5°C and boiling point less
than 300°C."

3. In chapter 3, delete S.P. 75.

4. In Table 12.2, UN No. 2206, amend substance name as above.

5. In Table 12.2, add UN 30XX, name as above, 6.1/II, 3, 4, 12.5.2., N.A., N. 12.22.2.

6. In Index, amend existing entry

ISOCYANATES, N.O.S., ... UN 2206
as above

7. In Index, add new entry

ISOCYANATES, N.O.S., ... UN 30XX
as above

8. In chapter 2, UN No. 1719, delete PG II, add S.P. 112.

9. In Table 12.2, UN No. 1719, under 8/II add 8/III, 2.45, 12.5.2, A/12.7.2, N., 12.22.2.

10. In chapter 2, UN No. 2344, delete S.P. 102, add PG II.

11. In Table 12.2, UN No. 2344, column 3, delete 3/102, substitute 3/II.

12. In paragraph 13.8.4, add

UN No. 2478 .....
UN No. 3031 .....
UN No. 3032 .....
UN No. 1409 .....
UN No. 2207 .....
UN No. 2788 .....
UN No. 1903 .....
UN No. 30XX .....

13. In chapter 2, delete UN No. 1851 .....

14. In chapter 3, delete S.P. 51.

15. In paragraph 13.8.4, delete UN No. 1851 .....

16. In Index, delete MEDICINES, N.O.S., UN No. 1851.

17. In Chapter 2, delete UN No. 1142 and UN No. 1168.

18. In Table 12.2, delete UN No. 1142 and UN No. 1168.

19. In Index, delete FLAMMABLE LIQUID PREPARATIONS, N.O.S., ... etc. UN No. 1142.

20. In Index, delete DRIERS, PAINT or VARNISH, LIQUID, N.O.S. UN No. 1168

21. In chapter 2, delete UN No. 1371.

22. In Index, delete DRIERS, PAINT or VARNISH, SOLID, N.O.S., UN No. 1371.

23. In chapter 2, delete UN No. 1375.

24. In paragraph 13.8.4., delete UN No. 1375.

25. In Index, delete FUEL, PYROPHORIC, N.O.S., UN 1375.

26. In chapter 2, delete UN No. 1896.

27. In Index, delete RESIN SOLUTION, POISONOUS UN 1896.

28. In chapter 1, paragraph 1.40(c), after "class" insert ", physical state". and in paragraph 1.41, same insertion.

29. In chapter 2, UN No. 2426, delete S.P. 78.

30. In Table 12.2., UN No. 2426, delete "not permitted for transport in tank-containers", substitute 4, 12.5.2, A/12.7.3, 12.9.3, 12.22.2 and add superscript notes 7, 12 and 13 to substance name.

31. In Table 12.2., introductory text (b) add

"12. The tank should be fitted with a special device to prevent under-and-over-pressure, during normal transport conditions. This device should be approved by the competent authority. Pressure relief requirements are as indicated in Recommendations 12.9.3. to prevent crystallization of the product in the pressure relief valve.

13. Only inorganic non-combustible materials should be used for thermal insulation of the tank."

32. In chapter 6, paragraph 6.6 (a) add new second sentence

"Concentrations below the minimum stated in the Packing Group III columns of Table 6.1 are considered non-dangerous."

33. In chapter 2, amend UN No. 2480 to read

"METHYL ISOCYANATE, 6.1, 3, -, I, -, -."

34. In Table 12.2, delete UN No. 2480.

35. In Index, delete existing entry "METHYL ISOCYANATE ..." substitute "METHYL ISOCYANATE 6.1 2480."

36. In Index, delete Misch metal, see 4.1 1333

37. In Index, add Cer mischmetall, see 4.1 1323

38. In chapter 2, UN No. 1333, amend entry to read "CERIUM, slabs, ingots or rods, 4.1, -, -, II, -, -,"

39. In chapter 3, delete S.P. 30

40. In Index, replace "CERIUM, CRUDE" by "CERIUM, slabs, ingots or rods"

41. In chapter 2, add

"30XY CERIUM, turnings or gritty powder 4.3, -, -, II, -, -, -,"

42. In Index, add

"CERIUM, turnings or gritty powder 4.3 30XY."

43. In chapter 2, delete UN No. 1867 CIGARETTES, SELF-LIGHTING ...

44. In Index, delete CIGARETTES, SELF-LIGHTING UN 1867

45. In chapter 2, add new entry:

"30XZ METHACRYLONITRILE, 3, 6.1, -, I, -, -."

46. In Index add METHACRYLONITRILE..... 30XZ

47. Add Special Provision 175 to the following entries in chapter 2:

2080	2081	2083	2084	2091	2092	2093	2094
2095	2096	2097	2098	2100	2103	2104	2107
2110	2111	2115	2116	2118	2122	2123	2125
2126	2127	2128	2131	2132	2134	2139	2140
2142	2143	2144	2145	2146	2150	2151	2155
2157	2158	2160	2161	2162	2163	2167	2169
2170	2171	2175	2176	2177	2179	2180	2182
2183	2184	2185	2550	2551	2562	2563	2594
2883	2886	2888	2889	2891	2897	2898	2957
2961	2963	2964	3044	3045	3046	3047	3060
3067	3068	3069					

48. Add UN No. 2756 "ORGANIC PEROXIDES, MIXTURES" to the list in paragrpah 13.8.4.

49. In chapter 3, in Special Provision 104, delete "and additionally with the name of the main constituent of the mixture" from the first sentence. Delete the second sentence.

Annex 5

REPORT OF THE WORKING GROUP ON ORGANIC PEROXIDE TEST METHODS

1. The working group engaged in the preparation of a manual of test methods for organic peroxides met under the chairmanship of Mr. Th. GROOTHUIZEN (Netherlands). Representatives of the following countries participated in the working group: France, Germany, Federal Republic of, Japan, Netherlands, Sweden, United Kingdom, United States of America. The European Council of Chemical Manufacturers Federations (CEFIC) was also represented.

2. It was decided to discuss the test methods following the sequence of the flowchart. Items to be discussed were:

   (a) revisions and addenda to the test descriptions

   (b) review of test criteria and submitted examples of results

   (c) comparison of test results to determine where adjustment of test criteria was necessary.

   This comparison was done on the basis of a data base prepared by the Netherlands, wherein test results of all participating countries were collected. A similar comparison based on this data base was submitted by the representative of Japan and was considered equivalent. The latter work was carried out by the Organic Peroxides Producers Association of Japan.

GENERAL ITEMS APPLICABLE TO THE TEST DESCRIPTIONS

3. A proposed layout of the descriptions was discussed and agreed (see Appendix 1). It was decided to limit the number of Figures to the minimum necessary to visualize the principle of the test. Complete technical and engineering data can always be obtained from national contacts. An Appendix giving these contacts will be drafted.

4. To harmonize the test descriptions it was decided that the Netherlands would edit all the adopted descriptions. The complete draft of the manual, to become Part III of the volume "Tests and Criteria" (ST/SG/AC.10/11) will be submitted to the secretariat at the beginning of November 1986, two months being considered necessary for the editing work.

5. The test descriptions were assigned to one of seven test series (letter A-G) each giving an answer to one of the questions in the flowchart. Within each series the descriptions of the tests are given a unique identification number starting with the letter of the series followed by a number (1, 2, etc.)

6. It was decided that the wording in the column "result" of the tables with examples of results shall be the same as given at the exits of the various flowchart boxes.

TEST SERIES A, DETONATION (BOX 1 OF FLOWCHART)

BAM 50/70 steel tube test, test A1

7. This test is described in -/R.535 and a late paper. Both proposals were accepted with the following additions:

In -/R.535: paragraph 3, line 6, change "Fig. 2" into "Fig.2 2/"

paragraph 3, last line, change footnote "1" into "2"

page 2, change footnote "1" into "2"

annex, page 2, delete "fig. 1.1"

[Late paper: page 1, paragraph 3, change footnote "2" into "1"] */

TNO 50/70 steel tube test, test A2

8. The test is described in -/R.481 and -/R.481/Add.1. Since in two of the described tubes the booster charge is situated outside the tube instead of inside the tube, the criterion for a "partial" has to be modified slightly. It was agreed that the limit between "partial" and "no" shall be set at 24 cm for tube type A, 15 cm for type B and 26 cm for tube type C.

In paragraph 7 "Examples of results" the first test results of UN No. 2097 were deleted and the result of UN No. 2143 changed from "partial" to "no".

Gap test for solid and liquid organic peroxides, test A3

9. For test description see -/R.483/Rev.1, it was accepted with the following remarks:

In 2.2.1, the mass of the donor charge will be added.

In 2.6, the apparent density of the tested solids will be added. For UN Nos. 2095 and 2116 the concentration will be specified.

---

*/ These unofficial late papers are available for consultation with the secretariat.

Gap test, test A4

10. For description of test see -/R.494/Rev.1, it was provisionally accepted with the following remarks:

Paragraph 3, delete second sentence.

The test criteria for "partially" and "no" will be reconsidered. Instead of an impression in the witness plate, the length and type of fragmentation will be used as criteria. New criteria will be submitted as soon as possible.

Comparison between results of series A

11. In general all results were in good agreement. However, there are several products which give rise to discrepancies and the possible causes of these were discussed.

UN No.	Reason
2090	Borderline case
2097	Borderline case
2102	Deviating limit for partial in test A4
2126	Deviating composition of the tested sample
2152/2154	Test A1 should be performed with measurement of velocity
2158	Test A3 with air bubbles and A1 without
2172	New A1 result confirms A3 result
2176	Test A3 with air bubbles and A2 without.

12. The following conclusions were drawn:

(a) In general the four test methods have to be considered as being equivalent. The only exception for the time being is the limit between "partial" and "no" for the French test which needs further study.

(b) Air bubbles can strongly affect the results of detonation tests.

(c) For liquid organic peroxides which are considered for bulk transport (Exit H) or exemption (Exit I) the detonation tests should be performed with cavitation.

(d) For liquid organic peroxides to be transported in packages up to 400 kg/450 l cavitation was felt unnecessary.

13. As a consequence of these conclusions the following changes to the descriptions were accepted:

Test A3 should be performed without cavitation and the description (procedure and examples of results) changed accordingly.

In the introduction of test series A a note will be added stating that for liquid organic peroxides which are considered for bulk transport or exemption the detonation test has to be repeated with cavitation.

In a new annex, information will be given on the method of cavitation including a reference substance (Mixture of Nitromethane and Methanol). This test will be required for liquids, dispersions, gels and pastes. The United States will prepare a draft for this annex. The agreed text for the introduction of test series A is given in appendix 2.

TEST SERIES B, DETONATION IN PACKAGE (BOX 2 OF FLOWCHART)

Detonation test in package, test B1

14. This test is described in -/R.514 and -/R.514/Add.1, the following addition will be introduced: a support will be placed underneath the witness plate. The adopted text for the introduction of test series B is given in appendix 3 as paragraph 7.1.

TEST SERIES C, DEFLAGRATION (BOXES 3 AND 4 OF FLOWCHART)

Time-pressure test, test C1

15. This test is described in -/R.480/Rev.1. It was adopted with the following alterations: paragraph 3, line 14, delete "(such as the Bell & Howell type 4-800-0001-0-30 bar)" and insert the sentence "Any pressure measuring device ... miscellaneous" as given on page 3 and delete the word "Note:".

Delete on pages 3 and 4 the text reading "The fusehead ... % Unignited debris: 0.75 gram/100".

Page 5, delete the last sentence of paragraph 4.

Paragraph 5, delete the last sentence "(Failure ... properties)".

Paragraph 6, change the second sentence into "the answers 3.2 and 4.2" "yes, slowly".

Paragraph 7, delete "deflagration test failed to ignite" (6 times) and delete "deflagration test 0.06 mm/s" from UN entry 2116, the footnote will also refer to UN entry 2116, the number of figures will be reduced and partly combined to yield three new figures.

The last substance should read "magnesium monoperoxy-phthalate hexahydrate, 85% with magnesium phthalate".

Deflagration test, test C2

16. The description of the test is given in -/R.481 and -/R.481/Add.1, the following alterations were introduced:

Paragraph 7, column "Rate" change "negative" into "no deflagration", delete example eleven "2,5 dimethyl... 2153 ... rapid" and change UN entry "2171" into "2172".

Comparison between the results of test series C

17. In general all results were in good agreement. It was noticed that water-wetted products show different results in the two tests as do some other volatile substances. Furthermore, it is expected that rapidly deflagrating solids (e.g. some self-reactive substances) may also give deviating results in the two tests.

The adopted text for the introduction of test series C is given in appendix 4 as paragraph 9.

TEST SERIES D, MECHANICAL SENSITIVITY (BOXES 5, 9 AND 11 OF FLOWCHART)

Bureau of Explosives impact machine for organic peroxides, test D1

18. The description of the test is given in -/R.483/Rev.1, the following alterations to this test description were accepted:

Paragraph 3.3, a diameter of .51 cm will be given for the sample cup.

Paragraph 3.6, the composition of UN entry 2092 should read "tert-Butylhydroperoxide, 70% with 18% di-tert-butylperoxide and 12% t-Butyl alcohol".

Rotter test, test D2

19. The description of the test is given in -/R.480/Rev.1, the following alterations to the test description were accepted:

In the final text the word "explosive" should read "substance".

For the Bruceton staircase technique, reference should be made to appendix 3 of the explosives manual.

Paragraph 2, sections of the text will be transferred to paragraph 4.

Paragraph 3.1, delete the text "Grade I recrystallized RDX ... approximately 7.5 kg".

Paragraph 4.1, delete second sentence, the footnote should refer to the word "sample" in the first sentence.

Paragraph 5.1, delete last sentence.

Paragrah 5.2, delete third sentence and change beginning of fourth sentence into "Normally the medium height is determined, but if ...".

Paragraph 7, change "2116" into "2116[b]", add "technically pure" to the name of UN entry 2158, add "hexahydrate 85% with magnesium phthalate" to the last peroxide entry.

BAM Fallhammer test, test D3

20. The description of the test is given in -/R.535 and a late paper. The description was accepted. The number of figures will be reduced to three.

30 kg Fallhammer test, test D4

21. The description of the test is given in -/R.494/Rev.1, it was accepted with the following amendments:

Paragraph 6, change head of last column "Boxes 5 and 9" into "Boxes 9 and 11" (English version only), delete third example being UN entry 2097.

Comparison between the results of the impact sensitivity tests of series D

22. The United States fallhammer data in the compilation data sheets have to be disregarded, the correct data are given in -/R.483/Rev.1.

As a result only the following substances can be used to compare the test results:

liquids: UN entries 2095, 2097, 2143 and 2158

solids: UN entries 2085, 2133 and 2172.

These differences can mainly be attributed to differences in air gap and in reference samples (RDX or PETN). All products showing differences exhibit explosive properties. Consequently, the distinction between

sensitive and insensitive is irrelevant as the products will not reach boxes 9 and 11. The distinction is relevant for "high" and "not high" (box 5 of flowchart) which is the case for the products 2095, 2097, 2158 and 2085.

Some of these products would as a consequence be banned from transport. Since no serious accidents have been caused by mechanical sensitivity for these products, a change in the flowchart was proposed. The change would make mechanical sensitivity testing unnecessary for these products.

23. The following conclusions were drawn:

(a) The flowchart will be changed. Delete box 5 and insert the scheme as shown in fig. 1.

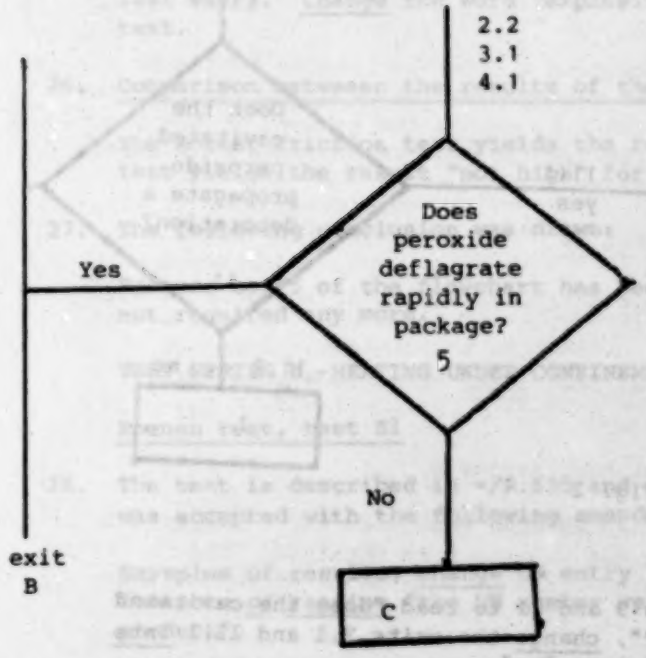

Fig. 1

(b) For the boxes 9 and 11 mechanical sensitivity testing is replaced by the question "Does the cavitated peroxide propagate a detonation?" Consequently, this part of the flowchart will be altered as shown in fig. 2.

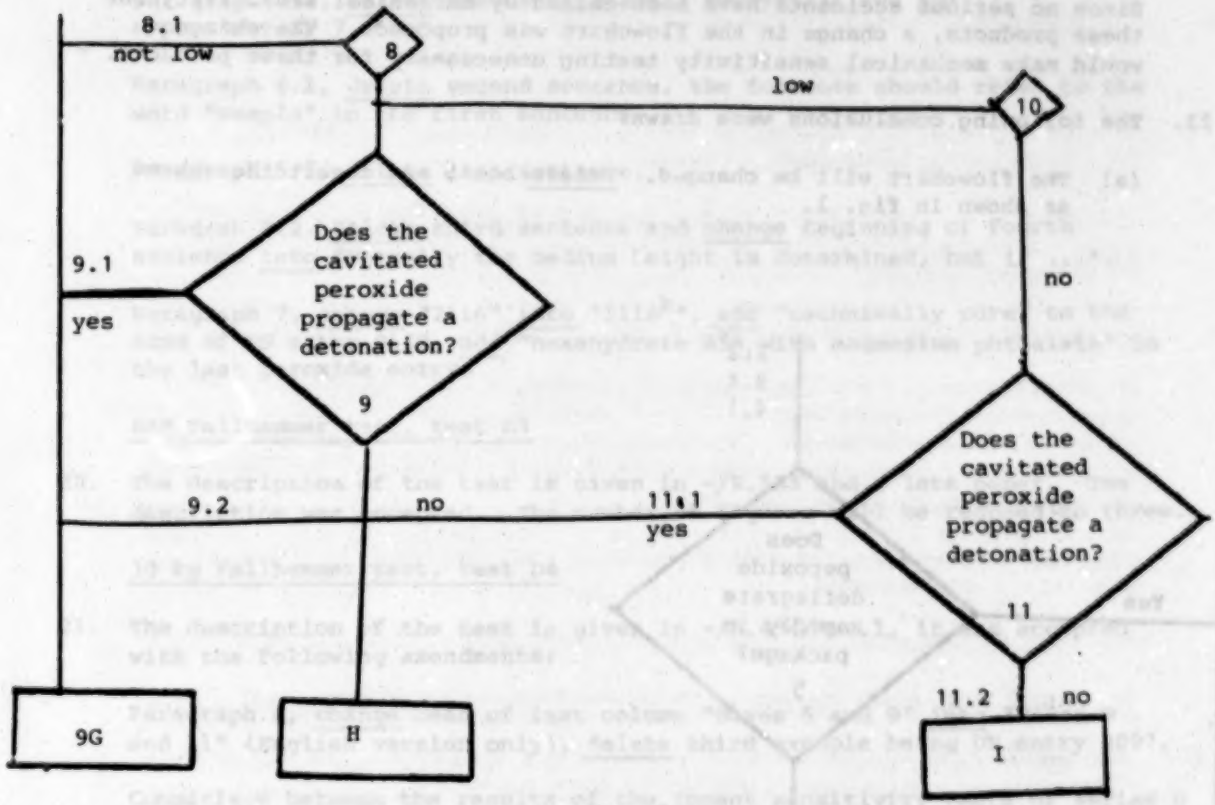

Fig. 2

Change present text in the boxes 9 and 11 to read "does the cavitated peroxide propagate a detonation?", change the exits 9.1 and 11.1 into "yes" and the exits 9.2 and 11.2 into "no".

Test series A can be used to answer the questions in boxes 9 and 11. The criteria for the answers 9.1, 11.1 and 9.2, 11.2 have to be drawn up for these tests by the countries who submitted tests for box 1. In order to get cavitation for pastes, it might be helpful to use "micro bubbles" (small glass spheres with air in them.)

The representative from the United States will draft a proposal to this end (see paragraph 13).

BAM friction apparatus test, test D5

24. The description of the test is given in -/R.535 and a late paper. The text was amended with the following alteration:

Annex, page 10, delete the example with UN entry 2143.

Rotary friction test, test D6

25. The description of the test is given in -/R.480/Rev.1, the following alterations should be made:

For the Bruceton staircase technique, reference should be made to Appendix 3 of the explosives manual. Paragraph 4, delete last part of last sentence starting with "recrystallized from ...".

Paragraph 7, add "hexahydrate 85% with magnesium phthalate" to name of last entry. Change the word "explosive" into "substance" throughout the text.

26. Comparison betweeen the results of the friction test of series D

The Rotter friction test yields the result "high" and the BAM friction test yields the result "not high" for UN entry 2085.

27. The following conclusion was drawn:

Because box 5 of the flowchart has been deleted the friction tests are not required any more.

TEST SERIES E, HEATING UNDER CONFINEMENT (BOXES 6, 7 AND 10 OF FLOWCHART)

Koenen test, test E1

28. The test is described in -/R.535 and a late paper. The test description was accepted with the following amendments:

Examples of results, change UN entry "2116" into "2116[c]" and add footnote c/ reading "the UN number refers to the technically pure product".

Paragraph 3, line 18, change "jet" into "flame".

Delete figure 4.2.

Paragraph 4.1, delete the text up to the wording "The threaded collar ..." and replace it by the text given in appendix 9.

Dutch pressure vessel test, test E2

29. The test is described in -/R.538, the following changes should be introduced:

Paragraph 3 (2), third line add "type AISI 316" at the end. Paragraph 4, line 22, change "detonation" into "explosion". Paragraph 6, second line, "$>$9mm" should read "$\geq$ 9 mm". Fourth line, "$>$3.5 mm" should read "$\geq$3.5 mm", sixth line, "$>$1 mm*" should read "$\geq$1 mm*".

It was pointed out that the United States pressure vessel test has a definition of limiting diameter which differs from that of tests E1 and E2.

United States pressure vessel test E3

30. The test is described in -/R.483/Rev.1, it was adopted with the following amendments:

Paragraph 1.3, delete sentence starting at line 14 reading "When the sample ... gloves." and change the sentence at line 13 into "The time to decomposition is noted." Paragraph 1.5, change the heading of the second column into "US PVT number". Paragraph 1.6, add to UN entry 2110 the value "75%" and add "85%" to UN entry 2116.

Thermal explosion vessel test, test E4

31. The test is described in -/R.481 and -/R.481/Add.1, it was adopted with the following amendments:

Paragraph 3 (2), line 2, add "AISI 316" after "stainless steel" and line 3, change "95" into "98".

Comparison between the results of test series E

32. The results of the tests E1, E2 and E3 have been used for a comparison. For many organic peroxides different results were obtained. The UN entries of technically pure products that have major differences in test results are: 2099, 2103, 2104, 2120, 2122 and 2129. Efforts to harmonize the results by changing the criteria failed. The explanation for this is that the tests operate in quite different pressure régime, heat the samples at different rates, have different degrees of filling, etc.

The predictive potential of the tests was checked by comparing the outcome of the different tests with the outcome of the Organic Peroxide Package Test, since the laboratory tests E1, E2 and E3 should in principle predict the result of this test.

The comparison with the Organic Peroxide Package Test results and the laboratory tests is given in table 1.

TABLE 1

Number (percentages) of lab test results deviating from the Organic Peroxide Package Test Result

Name of test	Total number of comparisons	Number deviating for violent	Number deviating for medium	Total number of of deviations
Koenen test (E1)	48	4 (8%)	9 (19%)	13 (27%)
Dutch PVT (E2)	42	4 (10%)	4 (10%)	8 (19%)
US PVT (E3)	82	7 (9%)	19 (23%)	26 (32%)
E1 and E2	39	2 (5%)	2 (5%)	4 (10%)
E1 and E3	48	4 (8%)	7 (15%)	11 (23%)
E2 and E3	42	4 (10%)	2 (5%)	6 (14%)
E1 and E2 and E3	39	2 (5%)	1 (3%)	3 (8%)

33. The following conclusions were drawn:

(a) It is advisable to use two tests instead of one test in order to detect products which might show violent decompositions in weak packagings.

(b) Boxes 6, 7 and 10 of the flowchart can be answered by one of the following combinations of tests:

Koenen test and Dutch Pressure Vessel test

or

US Pressure vessel test and Dutch Pressure Vessel test.

(c) In case box 6 is answered with "violent" a heating test in package has to be performed to find out if the product as packed requires in chapter 2 the subsidiary risk E or a Special Provision reading: "Under certain circumstances this substance may show explosive properties. For the packagings listed, it has been proven that the substance does not exhibit these properties."

(d) The boxes 6, 12, D and F should be changed as shown in Fig. 3.

(e) Change in box E of the flowchart the wording "E-mark in chapter 2, no E-label" into "(Special Provision in chapter 2)".

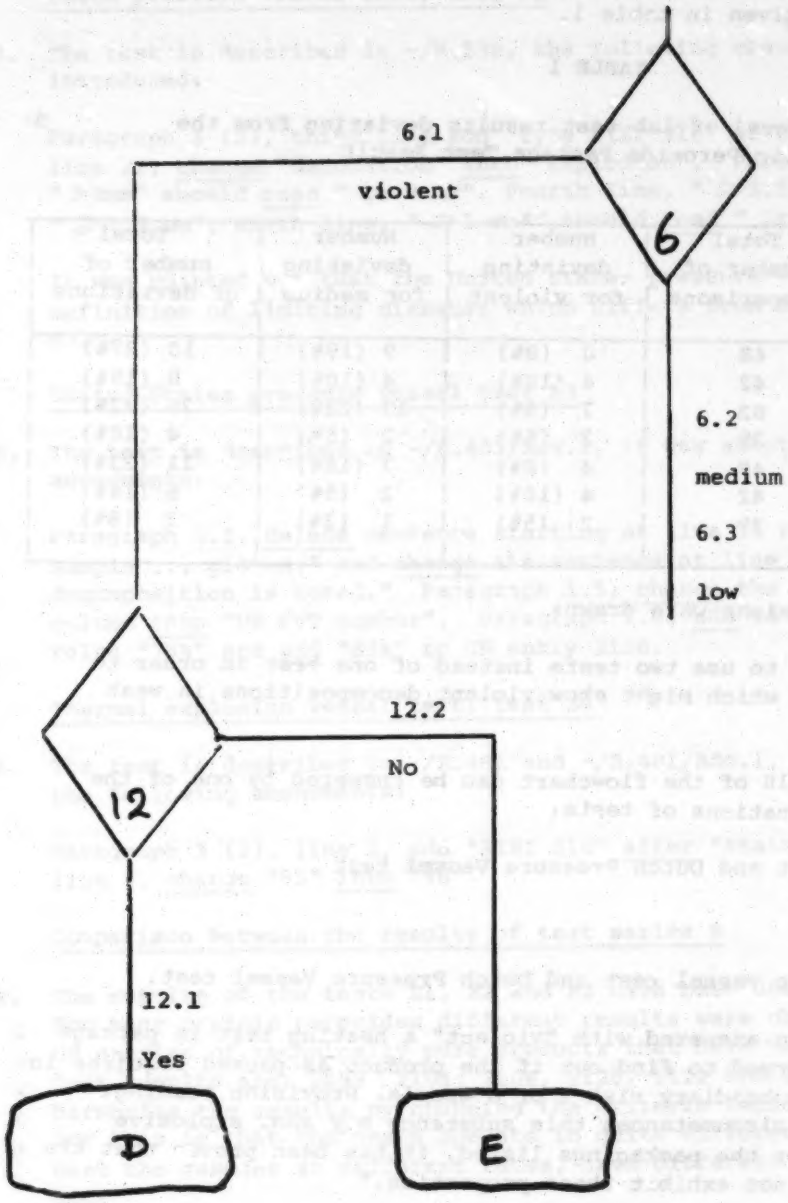

Fig. 3

(f) The representative of the United States will present a proposal containing the necessary information about the already listed substances with an F-mark in chapter 2 and the division of substances with an E-label and substances with the new special provision.

TEST SERIES F, EXPLOSIVE POWER (BOX 8 OF FLOWCHART)

The Ballistic Mortar Mk 111d test, test F1

34. The test is described in -/R.480/Rev.1. The text is accepted with the amendments:

Paragraph 4, reference should be made to Appendix 1 of the explosives manual concerning the UN/EXTEST detonator.

Paragraph 7, UN No. 2158, change "peroxyhexyne" into "peroxyhexyne-3" and add to the last example "hexahydrate, 85% with magnesium phthalate".

Ballistic Mortar test, test F2

35. The test is described in -/R.494/Rev.1. The text is accepted with the amendments:

Paragraph 2.6, the sentence should read "These are standard UN/EXTEST detonators charged with 0.6 g PETN (see Appendix 1 of explosives manual)." Delete Figs. 1 and 4.

Paragrah 2.3 change "play" into "gap".

Paragraph 3.2, second sentence, delete "such as Shell Avania grease No.2".

Paragraph 6, last column, delete "(exit)" and subsequent numbers.

BAM Trauzl lead block test, test F3

36. The test is described in -/R.535 and a late paper. The text was accepted with the following changes:

Paragraph 3.1, replace existing text by "Initiation of the substance is achieved by the UN/EXTEST with 0.6 g PETN (see appendix 1 of the explosives manual)". Examples of results, add to UN No. 2116 a new footnote reading "UN No. refers to the technically pure product".

Modified Trauzl test, test F4

37. The test is described in -/P.483/Rev.1. The test criteria and blasting cap have been changed so that the data in the data compilation sheets for

the F4 test results are no longer valid and should be replaced by the data in -/R.483/Rev.1. The text was accepted with the following changes:

Paragraph 5.6, UN 2092, the substance should read "tert-Butylhydroperoxide 70% in di-tert-butylperoxide and tert-butanol"

UN 2095, add 75% to the name of the substance.

UN 2116, add 85% to the name of the substance.

High pressure autoclave, test F5

38. The test is described in -/R.514 and -/R.514/Add.1, it was accepted with the following changes:

Paragraphs 3 and 4, delete parts concerning the waterbath calorimeter. The Netherlands will add the dimensions and material of the autoclave and sample vessel.

Comparison between results of test series F

39. A review of differences in test results is given in table 3. Most of the differences could be eliminated by changing the test criteria.

Table 3

Comparison between the different results of powertests

Substance UN No.	form	test F1	test F2	test F3	test F4	test F5
2085	Solid	L	NL	L	L	-
2095	Liquid	NL	-	L	NL	-
2097	Liquid	NL	NL	L	NL	NL
2102	Liquid	L	L	L	L	NL
2131	Liquid	-	NL	L	-	-
2126	Liquid	NL	L	L	-	-
2138	Paste	L	-	No	-	-
2172	Solid	L	-	NL	-	-
2132	Liquid	N	-	L	-	-

L is low
NL is not low

40. The following conclusions were drawn:

(a) The criteria for the tests will be set as follows:

test F1: 7 for NL/L and 1 for L/No

test F2: 7 for NL/L and 1 for L/No

test F3: 25 cm^3 for NL/L and 10 for L/No

test F4: 22 cm^3 for NL/L and 12 for L/No

test F5: 100 kJg/kg for NL/L and 5 for L/No

The consequences of the new criteria will be checked by means of the Database.

(b) For the time being the five test methods will be considered as being equivalent.

NEW TEST SERIES D, DEFLAGRATION TESTS IN PACKAGE (BOX 5 OF FLOWCHART)

Deflagration test in package, test D1

41. The test is described in -/R.514 and -/R.514/Add.1, it was accepted with the following changes:

Paragraph 4, the first four lines should be deleted here and transferred to the introduction of the new test series D.

TEST SERIES G, HEATING TESTS IN PACKAGE (BOX 12 OF FLOWCHART)

Thermal explosion test in package, test G1

42. The test is described in -/R.514 and -/R.514/Add.1, it was accepted with the following changes:

Paragraph 4, the first five lines should be deleted and transferred to the introduction of the test series G.

Organic Peroxide Package test, test G2

43. The test is described in -/R.483/Rev.1, it was accepted with the following amendments:

The text of paragraph 4.5.1 will be added to the text of paragraph 4.4. Paragraph 4.5.2 becomes paragraph 4.5.1 and add after the wording "Yes"

the text "If all the following observations are made:". Paragraph 4.6, UN No. 2110, add "75%" to the name of the substance, UN No. 2158, change "hexane" into "hexyne-3".

Comparison between the results of test series G

44. The tests G1 and G2 yield the same results for the products tested in both tests being UN Nos. 2097, 2103, 2110 and 2143. The results obtained with test G2 for the products UN No. 2090, 2111, 2963 and 2964 will be verified and these products will also be investigated with test G1.

45. For test series G, the following conclusions were drawn:

(a) The tests G1 and G2 are equivalent for all substances excluding water-wetted solids.

(b) For water-wetted solids the result of test G1 will have precedence over the result of test G2.

OTHER SUBJECTS CONCERNING THE MANUAL

46. At the meeting four papers concerning the manual were submitted and discussed.

Paper 1: Part III tests and criteria for the classification of organic peroxides

47. The paper was accepted with the following changes:

page 2, item b reads "A new type of packaging for an organic peroxide that is not mentioned for the specific organic peroxide in chapter 2. Fig. 1.1 and table 1.1 will be changed according to the alterations accepted at the meeting.

Paragraph 1.4.2, "a.o." should read "amongst others", delete "and ... down method".

Paragraph 1.4.3, first sentence should read "Details, specifications of equipment and addresses of suppliers can be obtained ...". Insert between "tests" and "are" the words ", particularly mechanical sensitivity tests,".

Paper 2: General conditions for testing

48. The paper will be redrafted taking into account that:

chemical conditions: e.g. water/moisture content should be specified as accurately as possible,

physical conditions: the sample should be tested under conditions, e.g. temperature, density, moisture content etc., which are representative for the anticipated transport conditions.

Paper 3: Example of test report

49. The paper will be redrafted. A description of the investigated sample will be required.

Paper 4: Example of classification

50. The paper will be redrafted. The example will make use of the flowchart scheme.

Other business

51. The United States submitted a paper concerning the wording of box 1. Several suggestions were proposed by the group but a general agreement on a new wording could not be reached.

52. Document -/R.512/Add.2 (IMO) contained miscellaneous comments and questions regarding the listing and classification of organic peroxides.

53. The following answers were provided:

(1) Are all the listed entries still needed by the industry?

As class 5.2 is a restricted class and normally only these substances and their concentrations listed by name are permitted for carriage, the entries so far included are needed in order to allow their transport if and when necessary. The list of entries is under constant review. In August 1985 the entries for UN Nos. 2117 and 2127 for example were deleted. Rather than deleting entries the working group may have to consider from time to time the specified concentrations and their upper and lower limits. IMO was invited to make proposals for the deletion of entries if this can be supported by evidence.

(2) Which solvents are used and what is their influence on the flashpoint, making subsidiary risk labelling necessary?

It was considered that this question had been resolved with the introduction of revised Special Provision 175 and its assignment to the liquid organic peroxides.

(3) What measures are to be taken when the SADT of a peroxide is subject to change with the quantity carried in a packaging, particularly in big receptacles such as tank containers?

The working group considered that the permitted packagings for all organic peroxides listed in the Recommendations take account of the SADT that may occur in these packagings. In case larger packagings should be introduced, then the SADT for that packaging will have to be considered separately. It will be recalled that organic peroxides to be carried under controlled temperature are not permitted in tanks. The experts from the Netherlands informed the working group that studies are being carried out in their country on the temperatures to be expected in freight containers and that the results would be made available in due course.

(4) Are all the listed packagings still needed?

The working group recalled that the matter was still under consideration and was also related to ongoing discussion concerning the E-mark. However, time did not permit discussion at the present meeting. The working group agreed that a review of the listed packagings would be carried out at a future meeting.

FUTURE WORK

54. The consequential changes in chapter 11 arising from the changes in the flowchart will be drafted by the representative of the Federal Republic of Germany.

55. The representative of the United States will look after the consequential changes in chapter 2 resulting from the working group decisions on the E-mark.

56. The Netherlands will do the editorial work on the peroxides manual (test descriptions, introductory paragraphs, etc.).

57. It was agreed that an additional working group meeting would be necessary to finish the work before the Committee meeting in December 1986, this would take place in Munich, 20-25 October 1986.

Annex 5 - Appendix 1

TEST A.1

BAM 50/60 STEEL TUBE TEST

3.1 PROPERTY TESTED

.Ability ..... propagate.
.Relevant box in flowchart: 1

3.2 APPARATUS AND MATERIALS

The ability ..... coating.

3.3 PROCEDURE

Normally ..... tests.

3.4 ASSESSING RESULTS

The test ..... classification.

3.5 TEST CRITERIA

3.5.1 TESTS WITHOUT VELOCITY MEASUREMENT

If the ..... follows:
Detonation : if the ..... and lower end
Partial : if the tube ..... exceeds 21 cm
No detonation: if ..... is remained

3.5.2 TESTS WITH VELOCITY MEASUREMENT

If the answer ..... as follows:
Detonation : if ..... lower end
Partial : if ..... exceeds
No detonation: if ..... remained

3.6 EXAMPLES OF RESULTS

table

---

drawing

Fig. 3.1 BAM 50/60 STEEL TUBE TEST Test A.1

Annex 5 - Appendix 2

2. TEST SERIES A: TESTS AND CRITERIA FOR DETONATION, BOXES 1, 9 AND 11

2.1 The question "Does the peroxide propagate a detonation?" (Box 1, Figure 1.1 of the General Introduction) is answered on the basis of the results of one of the following tests:

Test A.1	BAM 50/60 steel tube test	(see section 3)
Test A.2	TNO 50/70 steel tube test	(see section 4)
Test A.3	Gap test for solids and liquids	(see section 5)
Test A.4	Gap test	(see section 6)

[All tests are considered to be equivalent and only one test has to be performed.]*/

2.2 The question "Does the cavitated peroxide propagate a detonation?" (Boxes 9 and 11, Figure 1.1 of the General Introduction) is answered with "Yes" if in the cavitated version of the test (see Appendix ..), the result "Yes" or "Partial" is obtained. The answer is "No" if in the cavitated version of one of the tests the result "No" is obtained. This test is only necessary for substances which are tested for "Box 1" without enclosure of air bubbles (liquids, gels, pastes, etc.). For substances having enclosures of air bubbles (most of the solids), no test has to be done and the question in Boxes 9 and 11 can be answered with "No".

---

*/ The criterion for "Partial" in the A.4 test has still to be reconsidered.

Annex 5 - Appendix 3

7. TEST SERIES B: TEST AND CRITERIA FOR DETONATION IN PACKAGE, BOX 2

7.1 The question "Can the peroxide detonate as packaged for transport?" (Box 2, Figure 1.1 of the General Introduction) is answered on the basis of the results of the following test:

Test B.1 Detonation test in package (see section 8)

Annex 5 - Appendix 4

9. TEST SERIES C: TESTS AND CRITERIA FOR DEFLAGRATION, BOXES 3 AND 4

9.1 The question "Does the peroxide propagate a deflagration?" (Boxes 3 and 4, Figure 1.1 of the General Introduction) is answered on the basis of the results of one of the following tests.

Test C.1	Time-pressure test	(see section 10)
Test C.2	Deflagration test	(see section 11)

9.2 The answer is "Yes, rapidly" if shown to be so by the Time/Pressure test.

9.3 The answer is "Yes, slowly" if the Deflagration test result is "Yes, slowly" and the Time-pressure test result is not "Yes, rapidly".

9.4 The answer is "No" if the Deflagration test result is "No" and the Time-pressure test result is not "Yes, rapidly".

Annex 5 - Appendix 5

12. TEST SERIES D: Tests for a Rapid Deflagration in a Package, Box 5.

12.1 The question "Can the peroxide deflagrate rapidly as packaged for transport?" (Box 5, Figure 1.1 of the General Introduction) is answered on the basis of the results of the following test.

Test D.1 Deflagration test in package (see section 13)

Annex 5 - Appendix 6

14. TEST SERIES E: TESTS AND CRITERIA FOR HEATING UNDER DEFINED CONFINEMENT, BOXES 6, 7 AND 10

14.1 The question "What is the effect of heating it under defined confinement?" (Boxes 6, 7 and 10, Figure 1.1 of the General Introduction) is answered on the basis of the results of combinations of the following tests:

Test E.1 Koenen test	(see section 15)
Test E.2 Dutch pressure vessel test	(see section 16)
Test E.3 United States Pressure vessel test	(see section 17)
Test E.4 Thermal explosion vessel test	(see section 18)

14.2 Allowable combinations are the Dutch pressure vessel test (test E.2) with either the Koenen test (test E.1) or the United States Pressure vessel test (test E.3). For the classification the highest hazard rating will be applicable.

14.3 The thermal explosion vessel test has been accepted as a newly developed instrumented test. This test is listed to gain experience. It may not be used to classify substances for the time being.

Annex 5 - Appendix 7

19. TEST SERIES F: TESTS FOR EXPLOSIVE POWER, BOX 8

19.1 The question "What is the explosive power of the peroxide?" (Box 8, Figure 1.1 of the General Introduction) is answered on the basis of the results of one of the following tests:

Test F.1 Ballistic mortar Mk III d test	(see section 20)
Test F.2 Ballistic mortar	(see section 21)
Test F.3 Trauzl lead block test	(see section 22)
Test F.4 Modified Trauzl test	(see section 23)
Test F.5 High-pressure autoclave	(see section 24)

[All tests are considered to be equivalent and only one test has to be performed]*/

---

*/ Since the limits for this test series have been changed, it will be checked with the database, whether new contradictions have been introduced or not.

Annex 5 - Appendix 8

25. **TEST SERIES G: TESTS FOR EXPLOSION IN PACKAGE, BOX 12**

25.1 The question "Can the peroxide explode as packaged for transport?" (Box 12, Figure 1.1 of the General Introduction) is answered on the basis of the results of the following tests:

Test G.1 Thermal explosion test in package (see section 26)

Test G.2 Organic peroxide package test (see section 27)

Both tests are considered equivalent for all substances excluding water-wetted solids. For water-wetted solids the results of test G1 will have precedence over the result of test G2.

Annex 5 - Appendix 9

"4.1 Normally the substances are tested as received although in certain cases it may be necessary to test the substance after crushing. For solids, the mass of material to be used in each test is determined using a two-stage dry run procedure. A tared tube is filled with 9 cm^3 of substance and the substance tamped */ with 80 N force applied to the total cross-section of the tube. If the material is compressible then more is added and tamped until the tube is filled to 55 mm from the top. The total mass used to fill the tube to the 55 mm level is determined and two further increments, each tamped with 80 N force, are added. Material is then either added, with tamping, or taken out as required to leave the tube filled to a level 15 mm from the top. A second dry run is performed, starting with a first dry run. Two more of these increments are added with 80 N tamping and the level of the substance in the tube adjusted to 15 mm from the top by addition or subtraction of material as required. The amount of solid determined is performed with three equal increments, each compressed to 9 cm^3 by whatever force is necessary. (This may be facilitated by the use of spacing rings.) Liquids and gels are loaded into the tube to a height of 60 mm taking particular care with gels to prevent the formation of voids. The threaded collar ..."

---

*/ In cases where the physical form of the sample can be changed by compression and/or compression of the sample is not related to the transport conditions, e.g. for fibrous materials, more representative filling procedures may be used.